ILLINOIS POLLUTION CONTROL BOARD
August 1, 1985

IN THE MATTER OF:	)	
	)	
PETITION FOR SITE-SPECIFIC GROUNDWATER QUALITY STANDARDS BY CENTRAL ILLINOIS PUBLIC SERVICE COMPANY	)	R84-46

OPINION AND ORDER OF THE BOARD (by J. Anderson):

This matter comes before the Board on a petition for site-specific regulatory relief to establish alternative groundwater quality standards filed by Central Illinois Public Service Company ("CIPS") on December 18, 1984. First and Second Amended Proposals were filed on March 5 and 25, 1985, respectively. Hearing was held on March 13, 1985, in the City of Robinson, Crawford County, Illinois. Approximately seven members of the Public attended, primarily representatives of other Illinois electrical utilities, but provided no comments, questions or testimony. CIPS provided supplemental data in the form of Public comments on March 29, 1985. The Department of Energy and Natural Resources ("DENR") filed a "negative declaration" of economic impact on May 9, 1985, obviating the need for a full economic and environmental impact analysis. The Illinois Environmental Protection Agency ("Agency") provided comments on May 29, 1985, recommending that the Board grant the requested relief subject to some modifications. CIPS submitted final comments on May 30, 1985, and on June 20, 1985, the record closed by hearing officer order.

Procedural History and Prior Board Action

CIPS requests that the Board adopt site-specific groundwater quality standards for boron, manganese, total dissolved solids (TDS) and sulfate for the aquifer underlying their Hutsonville Power Station ("Station"). CIPS currently operates an unlined fly ash pond, as part of their wastewater treatment system, which is contaminating the underlying aquifer and is causing violations of the State's general use water quality standards for boron, manganese, TDS and sulfate and the Public and food processing water supply standards for manganese, TDS and sulfate. CIPS would like to build a new, unlined fly ash pond, as the existing pond is reaching its capacity. CIPS applied to the Agency for a construction permit for this new unlined fly ash pond on April 2, 1984. The Agency denied the permit on June 27, 1984, and an appeal of that decision was filed with this Board and docketed as PCB 84-105.

On November 8, 1984, the Board reversed the Agency's permit decision in part and affirmed in part. The Board found that the

fly ash pond was not a "point source" and that consequently, State effluent limitations were not applicable to the leakage. The Board also found that because the underground waters in question were currently being used as a public water supply of the non-community type, that general use, as well as Public and food processing water supply standards were applicable and were being violated. The Board notes that the DENR's letter of "negative declaration" of economic impact states that no water quality standards are presently applicable to groundwater. This is obviously incorrect, as the impetus for the instant rulemaking is the existance of violations of the applicable water quality standards.

As a consequence of this decision, CIPS filed the present regulatory proposal which would provide less stringent standards for boron, manganese, TDS and sulfates in the underlying aquifer. These site-specific standards, if adopted, would recognize the existing level of contamination due to 15 years of leaching from the current pond, as well as provide for continued contamination from a new unlined pond.

At a special Board Meeting held July 19, 1985, the Board by a 5-2 vote adopted an Order dismissing these proceedings, intending thereafter to issue an Opinion. At its August 1 meeting, a Board Member's motion to reconsider that Order carried by a vote of 6-1. This Opinion, and the accompanying Order denying the requested rule change, constitute the Board's final action in this matter.

Facts

The CIPS Hutsonville Station is a coal burning facility, located adjacent to the Wabash River. The proposed fly ash pond would be part of the system used to process fly ash transport water. Water is taken from the Wabash River and used to clean and convey fly ash from the station's electrostatic precipitators. Because of high levels of total suspended solids (TSS), the wastestream cannot be discharged directly to public waters. CIPS plans to sluice fly ash to the proposed pond. Overflow from the proposed pond will be routed to an existing fly ash pond from where it will ultimately discharge into the Wabash River through the currently permitted National Pollution Discharge Elimination System (NPDES) outfall.

The existing fly ash pond occupies 24 acres, is unlined, and is built with material native to the site (Amended Proposal p. 1, 5, R. 44). It receives a number of wastestreams in addition to fly ash and is nearing its capacity. Data from nine groundwater monitoring wells installed in February, 1984, clearly indicates that leachate from the existing unlined fly ash pond is leaking into the underlying aquifer and is entering the groundwater. The groundwater monitoring data shows values consistently higher than the general use water quality standards for boron, manganese, sulfate and TDS. The relevant well data is shown on the following page.

EXHIBIT 3
HUTSONVILLE GENERATING STATION
1984 GROUNDWATER MONITORING RESULTS

Manganese (mg/l)

	2/16	2/23	2/29	3/1	3/7	3/15	3/19	4/16	5/15	5/26	5/30
M-6	0.446	0.470	1.0	**	0.95	0.667	0.553	1.297	1.188	1.43	1.286
M-7	*	*	1.091	**	1.0	0.508	0.421	0.811	0.781	0.750	0.679
M-8	*	*	**	0.259	0.15	0.015	0.197	0.257	0.688	0.417	0.607

	6/18	7/18	8/15	9/12	10/17	11/15	11/29	12/12	12/27	1/17
M-6	0.867	2.93	3.07	0.65	Dry	1.8	2.04	3.0	2.5	1.60
M-7	0.383	0.57	0.751	0.4	0.83	0.88	1.11	1.15	1.0	0.29
M-8	0.208	0.22	0.221	0.3	0.13	0.35	0.333	0.343	0.4	0.17

TDS Residue (mg/l)

	2/16	2/23	2/29	3/1	3/7	3/15	3/19	4/16	5/15	5/26	5/30
M-6	1044	1160	1213	**	906	1012	934	825	438	892	865
M-7	*	*	880	**	960	902	835	857	916	857	881
M-8	*	*	**	839	874	851	814	841	715	860	832

	6/18	7/18	8/15	9/12	10/17	11/15	11/29	12/12	12/27	1/17
M-6	793	938	857	940	Dry	1076	1325	1460	1265	1204
M-7	862	995	934	980	787	659	619	812	843	975
M-8	789	909	813	925	762	758	762	774	774	770

Boron (mg/l)

	2/16	2/23	2/29	3/1	3/7	3/15	3/19	4/16	5/15	5/26	5/30
M-6	11.5	9.4	21	**	9.8	16.4	23.2	50.0	13.5	23.1	22.2
M-7	*	*	1.6	**	0.76	1.4	0.52	0.72	0.88	0.94	1.1
M-8	*	*	**	7.9	23.8	22.5	14.3	30.8	15.8	14.8	13.9

	6/18	7/18	8/15	9/12	10/17	11/15	11/29	12/12	12/27	1/17
M-6	39.5	4.8	21.9	7.02	Dry	22.1	21.7	18.1	15.9	19.0
M-7	0.72	2.1	0.7	1.36	0.85	0.60	0.38	0.5	0.6	1.28
M-8	45.6	12.6	15.8	15.8	13.6	19.1	22.5	15.9	13.6	20.0

Sulfate (mg/l)

	2/16	2/23	2/29	3/1	3/7	3/15	3/19	4/16	5/15	5/26	5/30
M-6	519	522	564	**	330	419	375	271	132	313	265
M-7	*	*	336	**	292	301	276	257	333	240	244
M-8	*	*	**	371	378	350	346	347	313	301	310

	6/18	7/18	8/15	9/12	10/17	11/15	11/29	12/12	12/27	1/17
M-6	234	205	194	261	Dry	395	703	889	640	342
M-7	321	272	270	319	300	175	200	317	285	346
M-8	324	314	283	365	325	275	322	392	324	323

** Wells Flooded
* No Data

CIPS asserts that radial flow under the existing pond is estimated to be 50 to 100 feet beyond the borders of the pond, based on a hydraulic conductivity (k) of 1 x 10^{-3} cm/sec (R. 44). This k value appears to be an estimate as there is no evidence suggesting that permeability, pump, or slug tests were performed. If the estimate of k is too high, then the contaminant plume is likely to extend farther to the north and south than estimated by CIPS. At hearing, CIPS stated that they did not know for certain if the contaminant plume was completely within CIPS' property (R. 66).

After the leachate initially flows radially, it is further asserted that the leachate then generally flows east with the groundwater towards the Wabash River where it ultimately discharges. While no modeling was performed and no piezometric readings were taken, the general flow of the groundwater in this area was determined using the data from the groundwater monitoring wells (R. 54). The wells were sampled to determine the surface elevation of water in the aquifer. The direction of flow in this unconfined aquifer can be estimated by noting the decrease in water surface elevation as the flow approaches the river. In times of high water levels in the Wabash River, groundwater flow is subject to reversal of direction (2nd Amended Proposal p. 5). CIPS asserts that because of the great dilution potential of the Wabash River, there is little or no adverse environmental impact on the Wabash River from the contaminated groundwater. Little information regarding the characteristics of the river and no rigorous analysis of the impact of the contaminants were provided. The dilution ratio at the surface NPDES outfall is estimated to be 2000:1. The volume of this surface outfall was stated to be greater than the volume of subsurface discharge, so presumably the dilution ratio would be greater than 2000:1 (2nd Amended Proposal p. 10).

The aquifer that underlies the station is composed of highly permeable sands and gravels and is geologically desirable for development of a water supply well. In addition to the nine groundwater monitoring wells, there are two deep wells in this aquifer, 70 to 80 feet deep, that provide drinking water for the Station employees, as well as boiler makeup in the steam generating cycle (R. 49). There are approximately 30 to 40 employees per shift. Three shifts per day are operated. The groundwater monitoring wells are between 10 and 20 feet deep and capture groundwater from the upper part of the aquifer. The deep wells are finished at bedrock and draw water from the entire column of the aquifer.

Deep well data is shown on the following page, as compared with selected monitoring well data (Ex. 9).

The proposed fly ash lagoon will occupy 8.8 acres, will be unlined and built with the same native sands and gravels as the existing pond. It is undisputed that the proposed pond will leak in the same manner as the current pond. Loading of the proposed

EXHIBIT 9
DEEP WELL VS. MONITORING WELL WATER QUALITY

Manganese

	11/29/84	12/12/84	12/27/84	1/17/85
Deep Well #1	0.667	0.60	0.5	0.52
Deep Well #2	0.796	0.63	0.6	*
M-6	2.04	3.00	2.5	1.60
M-7	1.11	1.15	1.0	0.29
M-8	0.333	0.343	0.4	0.17

Total Dissolved Solids PQM

	11/29/84	12/12/84	12/27/84	1/17/85
Deep Well #1	481	511	500	555
Deep Well #2	391	401	399	*
M-6	1325	1460	1265	1204
M-7	619	812	843	975
M-8	762	774	774	770

Boron PPM

	11/29/84	12/12/84	12/27/84	1/17/85
Deep Well #1	1.24	0.8	0.7	1.75
Deep Well #2	0.46	0.12	0.12	*
M-6	21.70	18.1	15.9	19.0
M-7	0.38	0.5	0.16	1.28
M-8	22.50	15.9	13.6	20.0

Sulfate PPM

	11/29/84	12/12/84	12/27/84	1/17/85
Deep Well #1	117	113	120	120
Deep Well #2	76	81	73	*
M-6	703	889	640	342
M-7	200	317	285	346
M-8	322	392	324	323

* Out-of-Service

pond would be approximately 100 tons transported by 600,000 gallons of water on a daily basis (R. 71). The same general pattern of initial radial flow beyond the borders of the pond and eventual movement towards the river is expected to occur. The anticipated effect of the proposed pond is to increase leachate migration into the groundwater. Fly ash is comprised of very fine particles, the majority are glassy spheres, scoria, iron rich fractions, crystalline matter, and carbon. Silica, alumina, iron and calcium make up 95 to 99 percent of fly ash by weight. The remaining 1 to 5 percent is comprised of trace elements which may be toxic at high concentrations. There are no toxic organic pollutants associated with fly ash (R. 69-70).

Due to its size and shape, the characteristics of fly ash are that of a high surface area to volume ratio solid that has agglomerated materials on its surface. The spherical portion of the fly ash is somewhat immune to dissolution due to its glassy structure. However, on the surface of the spheres exist either easily exchangeable or adsorbed molecules which, when in the presence of a liquid, become dissolved. It is this latter characteristic which results in the majority of soluble elements in fly ash being eluted in the ash transport water and discharged through the surface discharge prior to settlement of the ash in the pond.

Another important characteristic of fly ash is its pozzolanic or self-hardening nature. Fly ash in the presence of moisture reacts with alkali and alkaline earth products to produce cementitious products. When these reactions occur, the permeability of the ash will decrease over time. However, this phenomenon has not been demonstrated at the existing pond as leakage is still occurring.

A final significant environmental attribute of fly ash is the amenability of leached materials from fly ash to attenuate in the soil matrix underlying ash ponds. While the extent of attenuation is highly dependent upon the nature of the soils, some degree of attenuation will occur in virtually all soil types, with clayey soils generally having the highest potential for attenuation. CIPS contends that because of the high flow rate of the groundwater that little or no attenuation will occur. However, as a general principle, some attenuation will occur (2nd Amended Proposal p. 6).

Fly ash is sluiced from the electrostatic precipitators to the ash pond by the transport water sluice system. As the sluice water enters the ash pond, the velocity of the water drops and fly ash particles settle out as the transport water flows from the influent pipe to the outfall structure. After a retention period of between 15 to 60 days, there are virtually no fly ash particles in the effluent (R. 71). During the retention period, a major portion of the leachable material goes into solution prior to the ash settling to the bottom of the pond. This dissolved material is discharged through the surface outfall to

the Wabash River (R. 71-72). The remaining leachable fraction impacts groundwater with higher concentrations of contaminants than the concentrations in the surface discharge. This is caused by two factors. First, water percolating through the ash is in contact with the ash much longer than the water in the pond. Second, the volume of water passing through the ash is contended to be smaller, proportionally, than the volume of water to which ash within the pond is exposed (R. 72). As a result of the longer contact time and reduced dilution effect, groundwater around the existing fly ash pond shows higher concentrations than in the surface discharge. The concentrations of contaminants in the leachate will gradually be reduced as successive pore volumes of water pass through the flyash.

CIPS contends that rapid leaching of contaminants will end after the ponds are retired from service, which will be in approximately 20 years when the Station is retired (R. 74, 86). CIPS estimates that the contaminants in the groundwater will be flushed through the aquifer to the river in approximately 25 to 150 years, which in geologic time is a relatively short period (R. 84-85). This is admittedly a very difficult period to estimate, and is presumably based on the relatively fast moving groundwater, highly permeable soils, and limited attenuation. Therefore, based on these extremely rough estimates, the aquifer underlying the Station will be contaminated for approximately 45 to 170 years beyond the present or potentially, until the years 2030 to 2155.

CIPS asserts that future adverse exposure to the contaminated aquifer will be limited because of their present ownership and control of the surface property (2nd Amended Proposal p. 7). The Station will be in service for approximately twenty more years. It is uncertain what the fate of the property will be after the facility is retired (R. 76). CIPS relies on the existence of physical remains of the Station as method of putting future land users on notice of the contamination. CIPS could also provide notice through the deed or documents of conveyance, although no firm plans or commitments have been made (R. 86-87).

CIPS contends that the potential uses that would be made of the property in the distant future also limit potential harmful exposure to the contaminated aquifer. CIPS hypothesizes that residential, commercial and industrial uses are unlikely due to the property's location and the physical remains. Agricultural applications (either grazing or crop production) would appear to be the most likely (R. 77). Additionally, CIPS believes that the property is an unlikely location for development of a public water supply because of its location, the current existence of other Public water supplies in the area, and because under the design criteria of the Illinois Water Well Construction Code - Rules and Regulations development of a well would be undesirable (R. 78-83). The Illinois Water Well Construction Code design criteria, located at 77 Ill. Adm. Code 920.40, provide at

subsection a) that "location of the well shall include utilization of every natural protection available to promote sanitary conditions." Subsection b) provides that "the well construction shall be adopted to the geologic formations and groundwater conditions at the site." Subsection c) provides that "water bearing formations shall be excluded by installing casings or a liner and properly sealing when such formations contain undesirable water or when the primary purpose for the well is to withdraw water from a deeper formation." Subsection d) provides that "capability of the well to produce as much of the desired water quantity as the aquifer or aquifers can safely furnish." CIPS argues that due to the contaminated state of the aquifer, that no shallow production wells would be located down-plume, according to these design criteria (R. 80-81). Additional location criteria are found in Section 920.50 which require consideration of existing sources of contamination and consequent minimum lateral distances for placement of wells. Finally, CIPS contends that Section 920.50(c) would preclude an area subject to flooding such as the site in question (R. 82-83).

The potential environmental impacts of the contaminants on human health, livestock watering, and irrigation were addressed by CIPS (R. 99). (Because of the negligible predicted impact on surface waters, aquatic toxicity was not analyzed.) Each contaminant is analyzed below.

1. Manganese - Manganese is an essential element for human and the average human intake is approximately 10 mg/day. The maximum concentration of 0.05 mg/l in domestic water was recommended by the World Health Organization, the U.S. Public Health Service and the USEPA to prevent undesirable taste and discoloration. According to a USEPA Health Assessment Document for manganese, published in 1983, there are no toxicity-based criteria or standards for manganese in freshwater and none have been proposed. This same document cited no information relating manganese exposure to cancer occurrence in humans or animals (R. 60-102)

   The USEPA's 1977 Quality Criteria for Water states that manganese is not known to be a problem in water consumed by livestock (R. 104).

   Studies cited in the 1972 Water Quality Criteria demonstrate that the sensitivity of plant species to excess manganese concentrations ranges greatly and is closely related to soil pH. With suitable management practices, all plant species should be able to tolerate 2.0 mg/l manganese under continuous irrigation applications; and for short-term use, up to 20 mg/l should not cause adverse effects (R. 106-107).

2. Total Dissolved Solids - The 1977 Quality Criteria for Water state that high levels of total dissolved solids, the exact concentration depends on the nature of the salts and on the

sensitivity of the individual, can cause gastro-intestinal distress that may produce laxative effects in humans. High concentrations may also produce swelling due to salt retention in sensitive individuals. These effects are temporary and disappear when the affected individual stops consuming the water.

According to the 1977 Quality Criteria for Water, high total dissolved solids in the range of 1,283 to 1,333 ppm produce unpalatable mineral tastes. When total dissolved solids are 1,750 ppm or greater, they can be corrosive to household plumbing (R. 106).

Studies cited in the 1977 Quality Criteria for Water indicate that chickens, swine, cattle and sheep can survive on saline waters with up to 15,000 mg/l salts of sodium and calcium combined with bicarbonates, chlorides, and sulfates, but only 10,000 mg/l of corresponding salts of potassium and magnesium. The limit for highly alkaline waters containing sodium and calcium carbonates consumed by livestock is 5,000 mg/l (R. 104-105).

The 1972 Water Quality Criteria state that the irrigation use of water depends on the ratio of cations present and their resultant osmotic effects. The National Technical Advisory Committee to the Secretary of the Interior in 1968 set standards for dissolved solids in irrigation waters for arid and semi-arid areas. Water with dissolved solids in the range of 1,000 - 2,000 mg/l in these areas may have some adverse effects on crops, such as various fruit crops. Water with dissolved solids in the range of 2,000 - 5,000 mg/l can be used in such areas for tolerant species with careful management practices (R. 107).

3. Sulfate - The 1977 Quality Criteria for Water states that sulfate levels above 250 mg/l may result in gastro-intestinal irritation in some individuals. These effects persist while the individual consumes water with sulfate at those levels. No long-term effects or chronic effects other than the gastro-intestinal distress are known to result from oral consumption of sulfates at the concentration of the proposed standard (R. 102-103).

Water Quality Criteria of 1972 state that waters in excess of 500 mg/l sulfates become undesirable for livestock watering due to potential gastro-intestinal upsets. These problems disappear when the water is no longer consumed by livestock (R. 105). An Illinois State Water Survey analysis stated that concentrations of sulfate greater than 200 mg/l begin to render waters unsuitable for certain irrigation applications. Sensitivity to such water is dependent upon other ionic species present and the type of crops to which the water is applied (R. 107).

4. Boron - The citations for boron are from the Preliminary Investigation of Effects on the Environment of Boron published by the USEPA in 1975 and Gough, 1979 (Ex. 13).

Boron is widely distributed in foods, and humans constantly ingest and excrete boron with little or no accumulation in the body. Minimum lethal doses of boric acid or borates have not been established. Intakes of up to four grams per day in adults without incident have been reported, while single doses of 10 to 20 grams have been reported to be fatal. However, the few reported cases of boron poisoning have involved high doses of boron administered either orally or dermally for treatments of infections.

Long-term consumption of water in excess of 4.6 mg/l caused chronic disruption of normal gastro-intestinal functions in some of the 288 individuals studies. It has also been documented that a few sensitive individuals developed inflammation and swelling due to consumption of water with boron. As soon as the consumption of water ceased, all symptoms disappeared without any permanent effects.

No evidence has been found to indicate that boron is a carcinogen; in fact, boron has been used in tumor therapy (R. 103-104).

A study by Weeth in 1974 indicated that cattle can tolerate at least 50 mg/l of boron with no adverse effects. Other studies cited in the USEPA Preliminary Investigation of Effects on the Environment of Boron have shown that dogs fed water containing 350 mg/l of boron demonstrated normal fertility, litter size, weight and appearance (R. 105).

Studies cited in the USEPA Preliminary Investigation of Effects on the Environment of Boron and in the 1972 Water Quality Criteria demonstrate that boron tolerance values vary greatly among plant species, ranging from sensitive citrus crops to tolerant plants, such as alfalfa. The most significant crops of concern in the Hutsonville area are corn, soy beans and wheat, which are classified in an intermediate sensitivity category with the limits of tolerance at 5.0 mg/l of water soluble boron. However, the tolerance levels of these species increase where irrigation is used only on an intermittent rather than continual basis (R. 108).

Regarding the probability of long-term irrigation in the Hutsonville area; the land in this area is characterized as bottom lands and in normal years experiences flooding and drainage problems due to an over abundance of moisture during the growing season. Therefore, CIPS contends that the practice of long-term irrigation does not appear to be likely in the future (R. 105-106). The Board does note, however, that this contention

refers specifically to current CIPS property, and not necessarily to all the lands underlain by the present or potential contaminant plume.

CIPS presented testimony on an array of possible pond liner and alternative management options and their costs, as compared with an unlined pond. The unlined option is based on detailed engineering evaluations, while the estimates for the alternatives are based on very rough "educated guesses" (R. 138-139). Construction and operation costs over the life of the plant have been reduced to present value in each case. The unlined option is estimated to cost $1,968,000, if on-site disposal of dredged fly ash is allowed; other disposal options raise the estimated cost (2nd Amended Proposal p. 18).

Options utilizing various types of liners are more expensive due to a number of factors. First, is the cost of liner materials and additional construction. Clay material is not native to the Station property and would have to be obtained off-site. Second, a lined pond has smaller capacity than an unlined pond of the same general dimensions and consequently needs to be dredged more frequently. An alternative to more frequent dredging is to build a larger lined pond, at an increased cost.

The cost of the liner options vary from $5,097,488 for a pond lined with ten feet of $1x10^{-7}$ cm/sec. maximum permeability clay ($6,418,976 for a larger pond with this type liner) to $3,054,000 for a pond lined with two feet of clay. A five foot clay liner would cost $3,945,033. Alternative ash management systems analyzed include: converting to a dry fly ash collection system at a cost of $4,752,425; frequent dredging of existing ash pond and dewatering on-site at a cost of $2,176,168; and construction of an off-site fly ash pond in an area with native clay of a suitable permeability at a cost of $4,116,012 (2nd Amended Proposal p. 18-20). Construction of a slurry wall system was not deemed feasible due to permeable bed rock (R. 140). Non-clay liner systems were estimated to cost $3,110,105 for a stabilized scrubber sludge liner, $3,207,336 for a synthetic liner and $3,341,604 for a soil cement liner (2nd Amended Proposal p. 18-20).

CIPS contends that any liner system will eventually leak and; therefore, water quality standards will eventually be impacted when the liner fails. A liner will, however, decrease the rate of leaching and the volume of water that percolates through the bottom and sides of the pond will be much lower (R. 118-119). Consequently, a greater volume of water will be discharged through the NPDES outfall. The record indicates that installation of a liner system will have no impact on compliance with the NPDES effluent standards (R. 120).

Proposed Regulatory Relief

CIPS requests that a new Section 303.323 be adopted by the Board. CIPS' final proposal adopts changes suggested by the Agency (P.C. 5, p. 3). The new rule establishes two sets of water quality standards in place of the general use water quality standards and the Public and food processing water supply standards presently applicable. A less restrictive set of standards would apply to the upper portion of the aquifer underlying CIPS' property, while a more stringent set of standards would apply to the lower portion of the aquifer. These standards would apply in subsurface regions defined by the legal description of CIPS' surface property and subsurface elevations referencing mean sea level. Compliance with the standards is determined on the basis of the type and frequency of sampling prescribed by the Agency's operating permit for the ash disposal system. Additionally, there are certain "safety valves" in the rule that allow up to 25% of the samples collected from a single monitoring location to exceed the standards and that single samples may exceed up to two times the prescribed numerical standards.

The currently applicable general use water quality standards are as follows: Boron - 1.0 mg/l; Manganese 1.0 mg/l; TDS - 1,000 mg/l; Sulfate 500 mg/l (35 Ill. Adm. Code 302.208). The Public and food processing water supply standards are as follows: Boron - no standard; Manganese - 0.15 mg/l; TDS - 500 mg/l and Sulfate - 250 mg/l (35 Ill. Adm. Code 303.304). The proposed rule is provided below:

Section 303.323 Underground Waters at the Hutsonville Power Station.

a) This section applies to the underground waters above elevation 350 feet Mean Sea Level (MSL) located in the South half of the Section Number Seventeen (17) in Township Eight (8) North, Range Eleven (11) West the Second Principal Meridian, in the County of Crawford, State of Illinois.

b) For the constituents listed below, the standards of 35 Ill. Adm. Code 302.208 and 302.304 do not apply to these waters. Instead, the following levels shall apply, provided that no more than 25% of the samples collected from a single monitoring location on an annual basis shall exceed the prescribed numerical standard and that no single sample shall exceed two (2) times the prescribed numerical standard.

1) From elevation 410 feet MSL to ground surface -

CONSTITUENT	STORET NUMBER	CONCENTRATION (mg/l)
Boron	01022	30.0
Manganese	01055	3.0
Sulfate	009451	600.00
Total Dissolved Solids	70300	1,300.00

2) From elevation 350 feet MSL to elevation 410 feet MSL

CONSTITUENT	STORET NUMBER	CONCENTRATION (mg/l)
Boron	01022	2.5
Manganese	01055	1.0
Total Dissolved Solids	70300	600.00

c) Compliance with numerical standards of paragraph 303.323(b) shall be determined on the basis of the type and frequency of sampling prescribed by the Agency's operating permit for the ash disposal system.

Discussion

CIPS presents a number of arguments in support of the requested relief. The "justification" for this regulation is based primarily on the following six elements:

1. The proposed fly ash pond would be located in close proximity to a large surface water body, the Wabash River;

2. Groundwater in the area of the proposed fly ash pond flows into the Wabash River;

3. CIPS owns all property between the proposed facility and the Wabash River;

4. There are no present or potential uses of the specific segment of groundwater which would be impacted by the proposed fly ash pond;

5. Groundwater which would be impacted by the proposed facility would have no impact on the water quality of the Wabash River; and

6. Groundwater impacts from the proposed fly ash pond will be at their most pronounced stage during the initial or operating years of the facility and will have been eliminated or reduced to insignificant levels at the time of closure or within a reasonably short time after closure.

While the Board does not necessarily accept these elements of "justification" as compelling, CIPS has failed to prove its case on its own terms and criteria. The Board recognizes the first and third elements to be true. They are simply statements of fact. However, it does find that the record contains insufficient information or data to support in full the remaining four elements.

While CIPS' assertion that the general groundwater discharge in the area of question is into the Wabash River is indeed the most simple and logical expectation, the record supports neither that all the groundwater does so discharge, nor that the discharge is all directly to the Wabash River. These are fundamentally important considerations because they direct themselves to the impact the proposal would have not only on CIPS, but also on the adjacent landowners.

Much of CIPS' position is based on the contention that the area of contaminated groundwater is confined to their property, and hence that no adjacent property would be affected as a consequence of adoption of the proposal The Board notes that CIPS has not provided any off-site monitoring data to support the contention of confinement of the contaminant plume to their own property. Moreover, the record itself does not support the position of no off-site contamination. Monitoring well M-6, which is located at the south property line, shows clear evidence of contamination by ash pond effluent. CIPS' exhibit 5, which consists of potentiometric maps, also shows that the direction of groundwater flow from the existing ash pond is southward from the pond, past well M-6, toward the property to the south. A prudent conclusion which could be drawn from these data is that the flow from the current ash pond does extend off the CIPS property towards the south.

The proposed ash pond is located, similarly to the existing ash pond, near the southern margin of the CIPS property. The potentiometric maps similarly suggest that groundwater flow from the proposed pond would be towards the south, and therefore off the CIPS property.

Less certain of interpretation, but nonetheless critical to this proposal is the question of possible groundwater contamination in other than the southerly direction In asserting that all the groundwater discharge is directly to the Wabash, CIPS tacitly implies that the plume of contaminated water does not extend eastward (the asserted direction of groundwater flow) beyond the Wabash. Although this may be the simplest flow system, there are no data in the record to support that this is the flow system of fact. The Board notes that there are many examples where assumed simple groundwater systems have shown, upon more specific investigation, to involve unexpected complexities, and that flow beneath and beyond a suspected discharge point is one such common complexity. Cross sections A-A and B-B from Attachment I of the proposal extend only to the

boundary of the site. The regional groundwater flow system can not be evaluated from these cross sections.

The Board notes that if the contamination does currently extend beyond CIPS property, or would do so with the addition of the new pond, and if the CIPS proposal were granted, that CIPS would be in immediate violation of their site-specific regulation by virtue of failure to meet the geographic limitations specified in a) of proposed section 303.323. These circumstances raise a question with the Board as to the sufficiency of the factual data upon which this regulatory proposal is based. CIPS makes the argument that the contaminated groundwater is within certain geographical boundaries, yet their own monitoring well data would seem to disprove this. Values for hydraulic conductivity (k) are represented as fact when they are, in reality, rough estimates. At hearing, the author of CIPS' groundwater report was not available for questioning by the Board or Agency (R. 55-59). Certain other information was inexplicably "deleted" from CIPS' filings (Proposal, Attachment I, Appendix A).

Proponent's position that there is no present or potential uses of the specific segment of groundwater which would be impacted by the proposed fly ash pond is not supported by the record. There is obvious evidence of present impact in that Proponent's own water supply wells show evidence of some contamination. Even with the great dilution that occurs in the deep production wells, there is evidence of contamination (Ex. 9). In the case of boron, there have been exceedences of the 1.0 mg/l standard in the deep well production zone (Ex. 9). Contaminant levels in other portions of the aquifer are much greater. The alternative levels proposed in the rule could result in adverse human impacts as a result of boron and sulfate consumption. More importantly, without data delimiting the extent of the current contamination plume, it cannot be determined that present uses of the groundwater beyond the CIPS property are not being impacted.

Potential uses are inherently more difficult to address due to uncertainty as to future land use. Future land use is particularly difficult to determine due to the long time intervals involved in returning the aquifer to an uncontaminated condition, which are by CIPS own assertions are on the order of 25 to 150 years beyond closure (45 to 170 years from present). Who could have safely projected in 1850 what life would be like in 1985? The Board finds it equally difficult to project in 1985 what land uses might be even 20 years from now, yet alone 170 year from now.

At the minimum, there is no question that the aquifer has potential for domestic and public water supply; it is used so now and there is no reason to believe that a future land owner might not wish to use it similarly. CIPS asserts that it is unlikely that any future owner might wish to exploit this potential because, among other reasons, regulatory guidelines would

preclude development of a well in the aquifer because the aquifer is contamianted. This logic is rather circular, because CIPS itself would have caused the contamination.

Beyond use as a domestic and public water source, there is also the prospect of other uses of the aquifer, such as livestock watering, irrigation, and industrial uses. This is particularly true if the contaminant plume extends eastward from the river. The record provides no confirmation that one or more of the uses might not be desirable in the future. Use of the aquifer for irrigation could present particular problems associated with the high boron content in the contaminant plume and the known sensitivity of crops to long-term irrigation with water of high boron concentration.

The Board, in adopting the 1.0 mg/l general use water quality standard for boron, stated the level was "...based on evidence that higher levels can harm irrigated crops. While 100% irrigation is unlikely in Illinois, the uncontrolled discharge of large quantities of boron is clearly undesirable." (In re Effluent Criteria, R70-8; In re Water Quality Standards Revisions, R71-14; In re Water Quality Standards Revisions for Intrastate Waters (SWB-14), R71-20, March 7, 1972, p. 6).

In element (6) CIPS presents contentions concerning the relationship between impact of the proposed ash pond and time. The Board agrees that the quality of the contaminated groundwater will likely improve after closure. However, the assertion that the impact will have been eliminated or reduced to insignificant levels at the time of closure or within a reasonably short time after closure is not supported by the record. Closure is estimated to be in approximtely 20 years, and the contention is that the pozzolanic properties of the fly ash will work towards sealing the pond over its 20 year lifetime. However, the present ash pond has been in use since 1968 (R. 8), a period of almost 20 years, and it continues to produce a not insignificant impact. There is no reason to believe that the proposed pond, which would be constructed similarly to the present pond, would behave differently. CIPS has further contended elsewhere in the record that contamination would persist from 25 to 150 years (R. 85) following closure, a statement which can not be reconciled with the position stated in element (6). While 25 to 150 years may be viewed as a geologically short time, as does CIPS (R. 85), the Board believes the relevant perspective here is human time, and that 25 to 150 years cannot be judged short on this more appropriate scale.

Additionally, CIPS makes other arguments in support of their proposal. CIPS relies on the Illinois State Water Plan Task Force's Strategy for the Protection of Underground Water in Illinois, October 9, 1984 (Ex. 9). CIPS believes that their proposal is consistent with this general policy document. CIPS also relies on the current regulations and guidelines regarding development of public water supply wells as evidence that future adverse impacts are not likely (Ex. 12).

Section 3(00) of the Act provides:

> "WATER" means all accumulations of water, surface and underground, natural, and artificial, Public and private, or parts thereof, which are wholly or partly within, flow through, or border upon the State. (Ill. Rev. Stat. 1983, ch. 111½, par. 1003(oo)).

Groundwater clearly is a "water of the State." 35 Ill. Adm. code 303.302 provides:

> The underground waters of Illinois which are a present or a potential source of water for Public or food processing supply shall meet the general use and Public and food processing water supply standards of Subparts B and C, Part 302, except due to natural causes.

The contamination of the aquifer in question is not due to natural causes. The term "potential source of water" should not be viewed too narrowly. The Board, in adopting Section 303.302 (old Rule 207), stated that:

> "Protection of groundwater is of paramount importance. The provision has been amended to make clear it does not protect natural brines or deal with the problem of deep-well disposal except to assure protection of present or potential water supplies."(In re Effluent Criteria R70-8; In re Water Quality Standards Revisions, R71-14; In re Water Quality Standards Revisions For Intrastate Waters, (SWB-14), R71-20, March 7, 1972, p. 11).

CIPS has attempted to prove that future uses are not probable. It has failed to show that future uses are not possible due to natural contamination . The intent of this regulation is to provide minimum water quality standards for all groundwater except in those aquifers that had no potential for potable use, such as natural brine aquifers used in the UIC program. The existing policy is to prevent man-made contamination where possible and to preserve potable underground waters as a resource for present and future uses. This broad interpretation of "potential" is appropriate in the context of groundwater, where contamination will persist for very long periods of time. Even in the instant situation, where flushing is relatively rapid in geologic terms, the time in human terms is long. In the instant case, the aquifer is actually a present public water supply source and is certainly a potential source in the future.

CIPS argues that they are making a "reasonable use" of the State's water resources" (R. 7, 142). The Board disagrees. By

utilizing an unlined pond system in the highly permeable natl5 e soils the leaking of contaminants is maximized. Large volumes of water are lost through the bottom and sides of the pond by design. CIPS has asserted that, under the prevailing groundwater conditions, the majority of this contaminated leachate will discharge to the Wabash River. To grant the requested relief, the Board must approve a scheme that intentionally maximizes contamination of an aquifer and relies on subsurface discharge to a river.

In Central Illinois Public Service Co. v. EPA, PCB 73-384, May 23, 1974, (affirmed Central Illinois Public Service Co. v. EPA and PCB, 36 Ill. App. 3d 397, 344 N.E.2d 229 (1976)), the Board found that a man-made lake situated within CIPS' property, which was a water of the State, could not be used as a treatment works. CIPS once again relies on its private ownership of the surface property as a justification for pollution of waters of the State. CIPS claims that this ownership creates a right of "reasonable use" of the underlying waters. While this concept was applicable under common law, Edwards v. Haeger, 180 Ill. 99, 54 N.E.176 (1899), the Act and Board regulations apply to all waters of the State, regardless of private ownership interests. Even if a "reasonable use" standard were applicable, the Board could not affirm this practice as such, where technology exists to control this contamination.

CIPS primary rationale for this rule is based on private ownership and eventual dilution of contaminants. As previously noted above, private ownership is not controlling. The record indicates that technology exists to control groundwater contamination. CIPS examined a number of liner options which could greatly control leaking into the aquifer. The Board agrees that all liners will eventually leak. However, a liner will greatly slow down the rate and reduce the volume of leachate. The leaking that will occur will be of a quantity more easily attenuated in the natural soils. While the volume of water leaking out the bottom and sides of the pond will greatly decrease, the record shows that there will be no impact on the quality of the discharge from the NPDES surface outfall.

Additionally, CIPS has analyzed non-containment strategies for reducing groundwater contamination; including converting to a dry ash system, frequent dredging of the existing pond and dewatering-on-site and construction of an off-site fly ash pond in area with native soils of sufficient impermeability. As CIPS analysis has demonstrated, denial of the requested relief does not necessarily force CIPS to install a particular liner system. It is beyond the scope of this record for the Board to specify a particular strategy to reduce contamination of the groundwater. The record merely demonstrates that alternatives exist to prevent groundwater contamination.

The record indicates that an unlined fly ash pond is the cheapest option available to CIPS. This fact alone is not

tantamount to a showing of economic reasonableness. Other options are more expensive, but would achieve a significant reduction in groundwater contamination. CIPS' analysis of the alternative control options indicates that technologies are feasible and are economically reasonable (Ex. 15).

The Board finds that the information in the record regarding site geology and groundwater flow is inadequate to form a basis for granting the requested site-specific standards. What the record does show is that the contaminant levels requested as alternative groundwater quality standards would pose both a human health risk through consumption and adversely impact agricultural property and crops through irrigation. CIPS requests a boron level of 30.0 mg/l for the upper portion of the aquifer. The record shows that boron at a level of 4.6 mg/l causes chronic disruption of normal gastrointestinal functions while levels of 5.0 mg/l will adversely impact irrigated crops commonly grown in the Hutsonville area (R. 103-104, 108). CIPS requests a sulfate level of 600 mg/l while levels of 250 mg/l will cause gastrointestinal irritation and levels of 200 mg/l will adversely impact irrigated crops (R. 102-103, 107). CIPS' own data on the health and environmental impacts of boron and sulfates demonstrate some degree of risk. Additionally, the record shows that installation of a containment system or other management alternative to control groundwater contamination is technically feasible and economically reasonable under these circumstances. The aquifer in question is both a present and potential public water supply and is highly productive. Future uses of the aquifer are highly likely especially during the long time period in question. The Board, therefore, declines to adopt the proposed regulation.

ORDER

The regulatory change sought by the Central Illinois Public Service Company in Docket R84-46 is hereby denied.

IT IS SO ORDERED

J. D. Dumelle and B. Forcade concurred.

I, Dorothy M. Gunn, Clerk of the Illinois Pollution Control Board, hereby certify that the above Opinion and Order was adopted on the 1st day of August, 1985, by a vote of 7-0.

Dorothy M. Gunn

Dorothy M. Gunn, Clerk
Illinois Pollution Control Board